REMARKS/ARGUMENTS

Favorable reconsideration of this application is requested in view of the above amendments and in light of the following remarks and discussion.

Claims 1 and 4-8 are pending; Claims 7 and 8 are withdrawn from consideration. By this amendment, Claim 1 amended; Claim 3 is cancelled; and no claims are added herewith. It is respectfully submitted that no new matter is added by this Amendment.

In the outstanding Office Action, Claims 1 and 3-6 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite; Claim 1 was rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 3,143,896 to Edwards; Claims 1 and 3 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 3,771,382 to Wilke; Claim 4 was rejected under 35 U.S.C. § 103(a) as unpatentable over Edwards or Wilke and further in view of U.S. Patent No. 2,468,506 to Millns; Claim 5 was rejected under 35 U.S.C. § 103(a) as unpatentable over either Edwards or Wilke and further in view of U.S. Patent No. 6,513,978 to Shirai; and Claim 6 was rejected under 35 U.S.C. § 103(a) as unpatentable over either Edwards or Wilke and further in view of U.S. Patent No. 4,235,122 to Walter. It is requested that the rejections of the claims be withdrawn, and that the claims be allowed, for the following reasons.

With respect to the rejection of the claims under 35 U.S.C. § 112, second paragraph, Claim 1 is amended by the present amendment to clarify the features of the claims. As best shown in Figure 1, the arch extends completely across two of the grooves in order to facilitate the balls circulating endlessly through the ball paths due to the relative movement between the nut and the screw shaft. Accordingly, withdrawal of the rejection of the claims under 35 U.S.C. § 112, second paragraph is respectfully requested.

The present invention, as set forth in independent Claim 1, is directed to a ball

screw device. Specifically, as recited in independent Claim 1, the ball screw device includes a nut having a plurality of first thread grooves and a screw having a plurality of second thread grooves and a plurality of balls configured to be arranged between the first and second thread grooves. A deflector is built into the nut to provide a ball return path, the deflector is shaped as an arch and includes both i) a pair of prop portions and ii) an intermediate portion formed between the pair of prop portions. The prop portions are inserted into a through hole formed into the nut and a concavity as the top plate of the ball-return path is formed on an inner surface of the intermediate portion. The arch formed by the above-discussed features and extends completely across a width of two second thread grooves. Claim 1 further recites that the guide member is shaped to have a cross section that is U-shaped, and the sidewalls of the guide member sandwich only the intermediate portion of the deflector piece.

It is submitted that none of the references of record, including Edwards, Wilke, Millns, Shirai, or Walter whether taken alone or in combination with one another, discloses or renders obvious the above-discussed features recited in independent Claim 1. It is therefore also submitted that these references do not teach or suggest the above-described advantages that are provided by the present invention.

Specifically, Edwards is directed to a ball nut return guide which includes a screw 10 having a helical groove 12 and a nut 14 having an internal helical groove 16 formed to complement the screw groove. Balls 18 fill the space provided by the helical grooves of the screw and nut. The balls 18 continuously cycle through the return tube 20 secured to the body of the nut by screws 22. As best shown in Figures 2-4 the ball-return tube 20 is the size of a single ball 18 and the balls 18 move from a first groove 16, pass over a second groove 16 and then flow back into a third groove 16 as best shown in Fig. 3. That is, the ball-return tube does not extend a width of two of the thread grooves 16 or 12 but rather across three

grooves 16. As such, Edwards does not disclose the features of the claimed invention discussed above.

Wilke is directed to a ball-threaded spindle nut with an overflow insert member. As clearly shown in Figure 2, Wilke shows guide paths formed by side walls 4a, top plate 4, and a guide rib 5. That is, the sidewalls 4a sandwich the entire top plate 4 or 5 so that the top plate can not be fixed into the nut directly. As such, the deflector 2 of Wilke is first assembled from the sidewalls 4a and the top plate, and then the assembled deflector is inserted into the hole of the nut.

In contrast, according to amended Claim 1, a U-shaped guide member sandwiches the intermediated portion of the deflector piece. In this way, the deflector piece can be fixed into the nut alone by the props of the deflector piece, and no step is created between the concavity of the deflector piece and the thread groove of the nut by grinding.

As further discussed in Wilke, a spherical-thread nut includes a nut housing surrounding a spindle 15 and having two adjacent thread starts having thread flanks 3 and a curve designated as 13. Upon the entrance of the ball 14 into the guide path 4 and 4a of the single transfer insert piece, the ball leaves its bearing lines at the point 10. As best seen in Fig. 1, the guide rib 5 does not extend across both of the thread starts. Instead, due to the cylindrical insert piece, the rib 5 merely extends across approximately half of each of the thread starts. Accordingly, Wilke does not disclose that the deflector piece is shaped as an arch and a concavity as the top plate of the ball-return path is formed on an inner surface of the intermediate portion of the deflector and wherein the arch extend a width of two of the second thread grooves. Additionally, Wilke does not disclose a U-shaped guide member that sandwiches only the intermediated portion of the deflector piece. Instead, the side walls 4a of Wilke extend along the entire length of the insert piece 2 and thus, sandwich the entire top plate 4 or 5.

Again, as set forth by the claimed invention, the deflector includes the arch portion and a pair of prop portions that are fitted into the nut. A concavity is formed at an intermediate portion of the arch and defines a top plate of the ball return path. During manufacture of the ball screw device, the defector piece is attached to the nut and inner surfaces of the nut along with an inner surface of the deflector piece are ground. Accordingly, there is no gap at a seam portion between the first thread grooves of the nut and the deflector piece. Therefore, when the nut is rotated by a motor, rotational force of the nut is smoothly transformed into force that moves the screw shaft in its axial direction by the balls being circulated. As a result, the screw shaft is moved in its axial direction. Similarly, when the screw shaft is rotated, the nut is moved in its axial direction and when one of the nut and screw shaft is moved in its axial direction, the other is rotated. Therefore, the balls circulate endlessly through the ball-roll path and the ball-return path according to the relative movement between the nut and the screw shaft.

In this case, it is asserted that the Office Action has not provided any required teaching, suggestion, or motivation in any of Edwards, Wilke, Millns, Shirai, or Walter to arrive at the claimed invention. Rather, the only motivation to combine aspects of these references is provided by Applicants' disclosure and therefore is the result on hindsight reconstruction of the references and is improper.

Accordingly, withdrawal of the rejection of the claims under 35 U.S.C. § 102(b) and § 103(a) is respectfully requested.

Consequently, for the reasons discussed in detail above, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal allowance. Therefore, a Notice of Allowance is earnestly solicited.

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact the undersigned representative at the below listed telephone number.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
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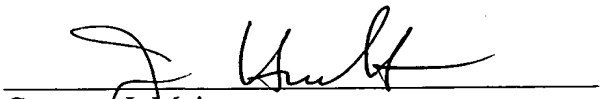

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